

THE DISTRIBUTION OF CERTAIN ECOLOGICALLY IMPORTANT GRASSES IN SOUTH AFRICA

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The ecologically most important attributes of grass are: 1. its ability to cover the ground with a permanent mat of foliage dense enough to protect it against the eroding action of wind and water, so that a depth of soil can accumulate and be held by the mass of fibrous roots possessed by grass; and 2. the fact that it provides the principal food of the grazing animal, whether wild or domestic.

The relative ecological importance of individual species of grass can be assessed according to the degree to which they have these attributes. One has, however, to consider their position in two entirely different environments, firstly the natural environment or climax in which the only animals present were the wild ones, and secondly the artificial environment created by the pastoral farmer in which, after a century or two, the only grazing animals present are domestic ones.

The main reason for the difference between the two environments is the traditional method of selective grazing introduced by the grazier wherever he has penetrated, as against the non-selective method of the wild animals. Their grazing was nonselective in two ways — either there were so many species with different tastes that between them they utilized the whole flora, or, in other parts, there were fewer species with the habit of gathering into such large migratory herds that they grazed and trampled every species as they moved forward. The effect of selective grazing by primarily grass-eating domestic animals has been to destroy the dominance of the climax grasses, to the extent that they may have disappeared entirely from large parts of their habitat. In humid country they are replaced by a sward of other grasses: less palatable, pioneers, minor climax species or invaders from less humid regions; in semi-arid and arid country they are not replaced by a sward of permanent grasses at all (except very locally by *Eragrostis truncata*, *E. bergiana* and *Tragus koelerioides*), so that the soil is exposed and general erosion occurs. Invasion by shrubby plants cannot stop the erosion.

When selective grazing ceases, either through complete resting, or, better, through application of an artificial form of non-selective grazing, a third environment appears, in which such of the pioneer grasses and climax grasses as have survived are free to try to re-establish a cover on eroding sub-soil.

There are thus four main groups of ecologically important grasses to be considered:

I. The palatable sward-forming climax species (or, in formerly forest country, subclimax species), which covered large tracts of country.

II. The palatable sward-forming climax species that were confined to particular habitats, and species of ecological importance for other reasons, for example, 1. of wet places; 2. of saline wet places; 3. of blowing sand; 4. of limestone; 5. of shady places; 6. of high mountains; 7. bush-suppressing grasses; 8. wintergreen grasses of importance in frosty country.

III. The unpalatable species which tend to usurp the position of the palatable dominants. Some are palatable, but too short to be effectively grazed.

IV. The pioneers and invaders from drier country. The climatic pattern of South Africa and, therefore, its vegetation pattern, arises out of a number of factors, for example: (1) Its latitude, between 22° and 35° S.



- (2) Its topography, the fact that most of it is a plateau at an elevation of 900—1700 m ringed by mountains of 1800—3300 m and that, although the escarpment follows the coast line at a distance varying between 50 and 240 km, there are other ranges of mountains parallel to the coast and up to 2200 m high, particularly in the south and south-west, which cause pronounced rain-shadows.
- (3) The presence of a warm ocean current on the east side and a cold current on the west side.
- (4) The presence of two distinct floras, the Southern Flora in the south-west and the Tropical Flora elsewhere.
- (5) The presence of the Kalahari sand in the north central part.

Certain patterns of distribution are thus imposed on the individual species of plants. Each species has its own habitat preferences and no two species have been found to have exactly the same distribution; but, generally speaking, they can be fitted into one of nine major patterns. To illustrate



them, the distribution of a selection of 44 species from the four groups of ecologically important grasses has been mapped. As seen from south of the Limpopo, they are:

Pattern 1, Maps 1 and 2: The North-eastern distribution of tropical and sub-tropical species

Of these tropical and sub-tropical species, some are confined to the warmer country below the escarpment while some extend on to the plateau. There is great variation in the distance penetrated inland and along the east and south coast belts.

Themeda triandra (ecological groups I and II. 7), was our ecologically most important grass, both to the wild animal and to the domestic animal, and the most widely distributed of the climax dominants. It has been grazed out or ploughed out so thoroughly that it remains as dominant only over small patches of its range.



Andropogon amplexans and *A. schirensis* (group I) are both grasses of the "sour" types of savanna and grassland, which lose their palatability in winter. They are not so sour as to remain ungrazed, unlike *Elyonurus argenteus* (group III) which is aggressive and tends to form a tussock grassland. This species is a typical "usurper".

Setaria flabellata (group IV) is a rhizomatous pioneer which does not form a dense sward, but, with the help of *Cynodon dactylon*, sufficient to prevent the sandier parts of its range from blowing.

Tristachya hispida (group I) is the most useful of the widely distributed sour grasses and often shares the dominance with *Themeda* in sour grassland.

Eragrostis chloromelas (group IV) is a pioneer, but a more useful one than *Setaria flabellata* in that it does form a very dense sward.

Panicum deustum (group II. 5) and *Urochloa mosambicensis* (group I) are both sweet grasses, retaining their palatability in winter, and require warm conditions. The former is a grass of shady places.



Pattern 2, Map 3: the south-eastern type of distribution

Setaria neglecta (group I), very similar to some forms of *S. sphacelata*, was more important than *Themeda* within its limited range but has become as scarce.

Melica decumbens (group I) has a negative ecological importance in that it contains a poisonous principle (causing "staggers") other than the usual cyanogenetic glucosides of grasses. Its leaves have a sandpapery surface which renders it relatively unpalatable; but because it is winter-green, it can interfere with grazing management in early spring when other more palatable grasses are either dry or, if winter-green, are grazed flat.

Stipa dregeana var. *elongata* (group II. 5) is another grass of shady places, either humid or semi-arid, provided they are relatively warm.

Pattern 3, Map 4: the Kalahari type of distribution

Antheophora pubescens (group I) is a soft-textured grass of sandy places, which has been largely grazed out and replaced by wiry grasses.

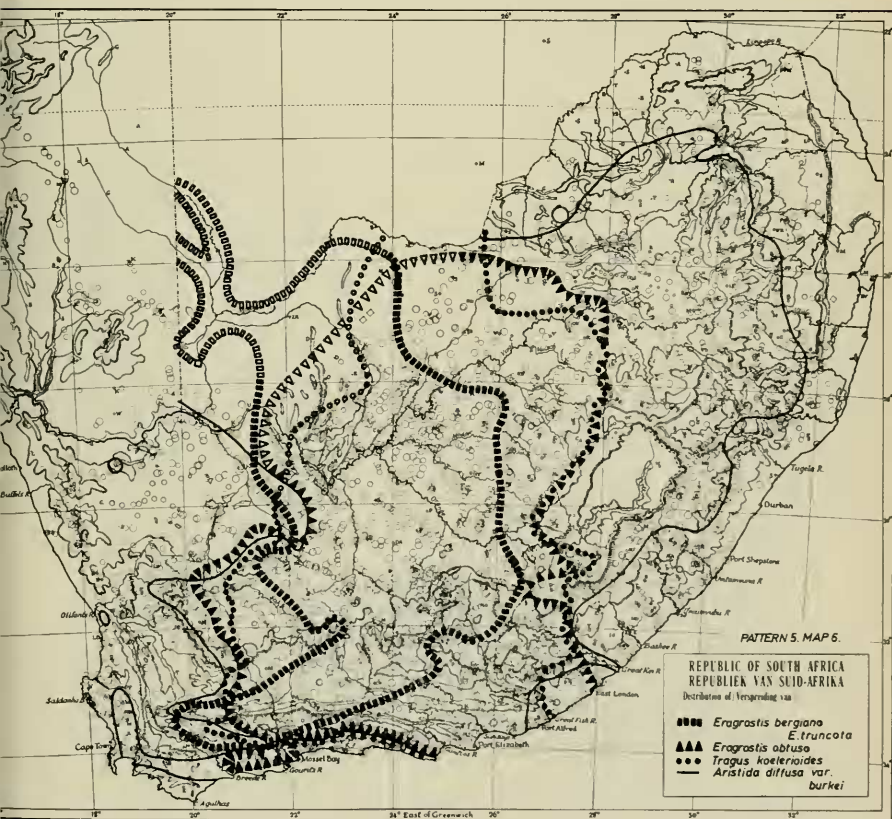


Cenchrus ciliaris (group I) is one of the bushy, twiggy grasses of arid country. It is usually found in rocky places, which may be its natural habitat in the cooler parts of its range; but there are indications that in warmer parts it was of general occurrence and of great importance.

Stipagrostis uniplumis (group I) is a grass of arid sandy plains. Although it has a small base and does not form a sward, its dense, bushy twiggy nature may be of equal importance in such country in keeping the wind off the loose surface of the soil.

Schmidtia bulbosa (group III), too, is a grass of sandy plains, but it is an usurper which can replace all the other grasses. It is sparsely twiggy, but provides enough cover to protect the sand from the wind and is sufficiently unpalatable to be difficult to graze out.

Aristida curvata (group IV) (together with *A. congesta* of similar distribution) is the universal pioneer in arid country and an invader of all but the coast belt and the wettest parts of the country.



Pattern 4, Map 5: the north-western type of distribution

Stipagrostis obtusa (group I) in the arid western half of the country had the same sort of importance as *Themeda* had in the eastern half. *S. ciliata* is of similar distribution and almost the same importance. In spite of their palatability, the efficiency of their seed-dispersal mechanism enables them to be invaders of less arid country.

Aristida anomala (group I) has exactly the habit of *Stipagrostis obtusa*, but is less abundant, probably because its seed dispersal mechanism is less efficient.

Sporobolus lampranthus (group I) is a very short fine-leaved grass which forms a dense mat of interlaced rhizomes, while *Panicum lanipes* (group I) forms a dense 2½ cm thick felt mat, the leaf-bases being covered with woolly hairs. These two grasses occupy precisely the part of the country where duration of sunlight and the desiccating effect of the desert north west wind are at their maximum.



Stipagrostis brevifolia (group I) is a small twiggy grass which looks like a karoo bush. Although very resistant to drought and grazing, it does not spread like *S. obtusa*.

Eragrostis bicolor (group IV) is the most important pioneer of low-lying places and flood-plains. A small-tufted grass which can develop into a sward, it is short-lived so that, although it is too short to be harmed by grazing, it must still be rested to give it every opportunity to seed if it is to maintain itself. It is followed in the succession by *Panicum stapfianum* and *Eragrostis chloromelas*.

It will be observed that the arid regions are well provided with permanent grasses.

Pattern 5, Map 6: the Karoo type of distribution

Eragrostis bergiana and *E. truncata* differ only in that the former is shortly stoloniferous. Both form a short, dense sward, usually on calcareous



soil, efficiently covering the soil but providing little grazing. They may be usurpers. The same applies to *Tragus koelerioides*, of similar habit to the former.

Eragrostis obtusa (group IV) is a pioneer, like *E. lehmanniana* which has the same type of distribution, and may be an invader in the eastern half of its range. They do not form a sward and die in a prolonged drought, so that their ecological importance is confined to the excellent grazing they provide when they are present. Their regeneration after the drought is very rapid and in the veld of today they are indispensable.

Aristida diffusa var. *burkei* (group III) is the universal usurper of the central part of the country and is invading the wetter country to the east and north-east. It is a wiry grass but not too unpalatable to be grazed almost to extinction in the drier parts of its range.

Pattern 6, Map 7: the east-central type of distribution

Tetrachne dregei (group I) is a grass of all habitats except wet places and is strictly confined to the plateau. The other three, *Fingerhuthia sesle-*



riaeformis (group II. 1), *Pennisetum sphacelatum* (group II. 1) and *Pennisetum thunbergii* (group II. 1), are grasses of wet places and are also found in the south coast belt, but are rare and of erratic occurrence there. They all form extremely dense swards, capable of holding a soft humus soil on 60° slopes, but have been grazed and eroded out almost to the point of extinction over much of their range.

Pattern 7, Map 8: the south-coastal and mountain type of distribution

Danthonia disticha (group III), a wiry tussock grass, may become dominant both in the coast belt and on the mountains, completely usurping the position of *Themeda* and other grasses.

Danthonia purpurea (group IV) is a dwarf mat-forming pioneer which in parts of the mountains may be left as the sole survivor of *Themeda-Tetrachne* grassland.



Hordeum capense (group II. 2, 8) is winter-green and a grass of brackish wet places. It is relatively unpalatable under selective grazing and has thus survived better than most such grasses.

Koeleria cristata (group II. 8) is a winter-green grass whose ecological importance in frosty parts of its range has come to be realized only since non-continuous non-selective grazing has been practised.

Pattern 8, Map 9: the western type of distribution

Chaetobromus dregeanus (group I) is a variable grass, ranging from the coastal dunes to the mountain tops, usually on sandy soil.

Eragrostis spinosa (group IV) looks like a thorny bush, ungrazable but important for its ability to stabilize moving sand in the driest parts of the country.

Eragrostis cyperoides (group II. 3 and III) is also bushy and ungrazable with the same ability to stabilize moving sand, especially on the west coast, where it may be left as the only permanent plant.

Ehrharta barbinodis (group II. 7) is a twiggy short-leaved grass with the ability to climb over and smother ungrazable bushes; but it is so palatable that under selective grazing it has become a rarity to be searched for inside such bushes.

Pattern 9, Map 10: the south-western type of distribution

Ehrharta calycina (group I), like *Themeda*, is a grass of many forms. In spite of its palatability and frost-resistance it has contrived to survive more generally than other palatable grasses. Inconspicuous and despised today, it still has a big part to play in re-establishing the grasslands of the southwest and southern Cape.

Ehrharta melicoides (group I) is a soft, fine-leaved, broad-based grass that is rarely seen today, but is capable of forming a dense sward.

Ehrharta capensis and the closely related *E. bulbosa* and *E. longifolia* (group I) are broad-leaved rhizomatous grasses with the peculiarity of possessing small hard tubers like grains of wheat at the bases of the culms. As these are below ground level, in their case there is no need for attempting the impossibility of uniformly grazing a palatable grass down to an arbitrary height of N cm.

Ehrharta villosa (group II. 3) is a rhizomatous grass with tall green, sparsely leavy culms and the ability to grow on moving sand. *Eragrostis cyperoides* has largely replaced it on the west coast.

The position in South Africa is, thus, that the areas occupied as dominants by the palatable perennial grasses, which were the dominants under natural conditions have shrunk under the pressure of selective grazing, or have disappeared entirely. Enough relics remain to give us an idea of their former distribution. These grasses have either been replaced by new dominants, unpalatable grasses which formerly were not dominants, or not replaced by perennial grasses at all.